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Nutritional assessment of orthopaedic patients: knowledge test for nurses

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Adequate nutrition during hospitalization is essential for the avoidance of postoperative complications and the overall improved patient outcome. Studies show high prevalence of malnutrition among orthopaedic patients. Nurses play key role in nutritional assessment and are responsible for the provision of good quality nutritional care.

The purpose of this final project was to produce a knowledge test for nurses working in orthopaedic wards. The final project answered the study question: What do nurses need to know in nutritional assessment? The ultimate goal of this final project is via applying the knowledge test, to help nurses develop the nutritional care, hence improve the overall nutrition among orthopaedic patients.

The high prevalence of malnutrition among orthopaedic patients and its negative impact on patient outcome became evident. Lack of consistency in nutritional assessment/screening as well as poor compliance with established assessment tools and nutritional guidelines was found among nursing staff. The use of nutritional assessment tool, nutritional monitoring and documentation, patients' involvement in nutritional care all came to importance in regard to nutritional assessment. Insufficiency of nurses' knowledge in nutrition and low priority given to nutritional assessment and nutritional care were drawn as major problems. Emphasis was placed on the benefits of nutritional training programmes and ongoing nutritional education of nursing staff, which brought evidence for improved nurses' knowledge and skills in nutritional assessment and nutritional care, increased awareness of nurses' responsibility for patient nutrition, and improved nurses' behaviour and patient education.

Nutritional assessment tools should be applied and nutritional care should be part of the overall nursing care. Nutritional assessment and monitoring on the wards should be increased. Malnutrition and factors contributing to nutritional risk among patients should be considered. Nurses should know the components of nutritional assessment and how to perform it on order to evaluate patients nutritionally.

Further investigations on the: benefits and boundaries of nurses' need of ongoing education in nutrition in regard to improving nurses' knowledge and skills in nutrition; reasons for the low priority given to nutritional assessment and nutritional care; reasons for the low compliance to the nutritional guidelines and and barriers in front of nutritional guidelines implementation; barriers in front of the use of nutritional screening/assessment tools; reasons for the difficulties met with preparing nutritional care plan; nurses' attitudes on nutritional assessment and care as well as nurses' knowledge and need of knowledge in nutritional matters.

Keywords	nutrition, nutritional assessment, nutritional care, nutritional risk, malnutrition, orthopaedic patients, nursing

Tekijä Otsikko Sivumäärä Aika	Kalina Hristozova Ravitsemuksen arviointi ortopedisen potilaan hoitotyössä: tietotesti sairaanhoitajille. 33 sivua + 2 liitettä Helmikuu 2015
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Riittävällä ravitsemuksella voidaan ehkäistä kirurgisten potilaiden leikkauksen jälkeisiä komplikaatioita ja edistää hoidon tuloksia. Tutkimusten mukaan ortopedisilla potilailla on todettu paljon aliravitsemusta. Sairaanhoitajilla on keskeisessä asemassa arvioitaessa potilaiden ravitsemustilaa ja laadukkaan hoidon toteuttamisessa.
Tämän opinnäytetyön tarkoituksena oli luoda tietotesti sairaanhoitajille, jotka työskentelevät ortopedisten potilaiden kanssa. Tavoitteena on kehittää ortopedisten potilaiden ravitsemusta
Tulosten mukaan ravitsemustilaa ei arvioida systemaattisesti eikä ravitsemussuosituksia noudateta. Suurena ongelmana on ravitsemustilan seuranta ja dokumentointi. Sairaanhoitajilla on puutteelliset tiedot ravitsemuksesta. Sairaanhoitajille kohdistetusta ravitsemuskoulutuksesta on todettu olevan paljon hyötyä. Koulutuksessa sairaanhoitajat ovat saaneet erilaisia tietoja ja taitoja ravitsemushoitoon. Sairaanhoitajat ovat ottaneet vastuun potilaan ravitsemuksesta ja ravitsemushoito sisältyy myös potilasohjaukseen.
Johtopäätöksenä voidaan sanoa että erilaisia ravitsemustilan arviointimittareita tulee käyttää järjestelmällisesti sekä tuloksia seurata ja dokumentoida. Ravitsemushoito on osa potilaan kokonaishoitoa. Sairaanhoitajien tulee tunnistaa potilaan vajaaravitsemus ja riskitekijät.
Jatkossa pitäisi arvioida täydennyskoulutuksen vaikutusta sairaanhoitajien tietoihin ja taitoihin ravitsemuksesta ja ravitsemuksen arvioinnista. Pitäisi selvittää miksi ravitsemussuosituksia tai ravitsemuksen arviointia ei noudateta hoitotyössä. Onko sairaanhoitajien asenteilla merkitystä ravitsemushoidon suunnittelussa ja toteuttamisessa vai onko kyse tietojen ja taitojen puutteesta.

Avainsanat	ravitsemus, ravitsemusarviointi, ravitsemushoito, vaajaravitsemuksen riski, vaajaravitsemus, ortopedisen potilas, hoitotyö

Table of Content

1 Introduction and background

Nutrition is essential to humans, as all metabolic processes depend on adequate nutrient intake. Smeltzer, Bare, Hinkle and Cheever (2010:67) highlight that nutrition not only maintains health, but also prevents the human body from illnesses. Moreover, nutrition takes part in the healing process during illness, and helps the body fight infections. (Smeltzer et al 2010:67). Bloomfield and Pegram (2012:52-53) state that a balanced diet containing all the nutrients and sufficient amount of water is crucial for maintaining good health, likewise nutrition and hydration are specially important during illness.

Bloomfield and Pegram (2012:53) continue that not only adequate nutrition during hospital stay plays essential role in patients' recovery after surgery and disease, further it is a factor in promoting wound healing and preventing infections. The authors underline that inadequate nutrition and hydration contribute to delayed recovery, prolonged hospital stay, and mortality risk (Bloomfield & Pegram 2012:53). Tappenden, Quatrara, Parkhurst, Malone, Fanjiang, and Ziegler (2013:147) also highlight that nutrition is essential for patient recovery. Posthauer (2012:15) notes that nutrition is vital to wound healing, and claims that identifying nutrition risk and referring to nutritional assessment come to importance in prevention and treatment of pressure ulcers. Further the author claims that nutritional interventions contribute to healing and improved quality of life as well as to reducing the length of hospital stay (Posthauer 2012:15).

There is a great deal of studies that deliver evidence on the prevalence of malnutrition and undernutrition among hospitalized patients. Raja and colleagues (2008:27) cite Elia and colleagues (2005) who showed that between sixty and eighty-five per cent of the patients at nutritional risk were not identified as such. According to Pedersen, Tewes, and Bjerrum (2011:178), around forty per cent of Danish hospitalized patients are at risk of undernutrition. In their study Khalaf, Berggren and Westergren (2009:5) provide evidence for approximately thirty per cent of hospitalized patients in Sweden being undernourished.

Malnutrition and undernourishment exhibit tremendously negative impact on patient outcome. As Pedersen and colleagues continue (2011:178), undernutrition results in increased mortality, higher hospital costs, and lower quality of life. Other negative effects are prolonged patient recovery and increased risk of complications (Raja et al 2008:27). In their study Ozkalkanli, Ozkalkanli, Katircioglu, and Savaci (2009:274) also point out

the increase of morbidity and mortality rates, costs, and length of hospital stay associated with malnutrition. Based on previous research, Tappenden and colleagues (2013:148) state that malnutrition upon admission to hospital is evident among at least one-third of the patients. The authors bring out that undernutrition is not uncommon in hospitalized patients, which is due to decreased food intake related to lower appetite, inability to chew and/swallow, increased energy and protein expenditure, and increase in nutrient needs due to infection, inflammation, and metabolic changes (Tappenden et al 2013:148-149).

Orthopaedic patients also need fast recovery with avoidance of any postoperative complications. In their pilot study Dillabough, Mammel and Yee (2011:196) point out that malnutrition and undernutrition are widespread among elderly, involving risk of fractures and infections, hence once hospitalized, it might take long for these patients to recover. In their profound study Khalaf, Berggren and Albert (2009:6) draw attention to the evidence that the highest prevalence of undernourishment occurs among elderly orthopedic patients. Ozkalkanli and colleagues state that malnutrition in orthopedic patients contributes to the development of complications such as infection and delayed wound healing (Ozkalkanli et al 2009:274). Therefore, inadequate nutrition in orthopedic patients is associated with poor outcomes such as prolonged hospitalization and postoperative complications.

The assessment of nutritional status gives important information about malnutrition, nutrient deficiencies, metabolic imbalances, and obesity, which may affect patients during the time of hospitalization as well as after discharge from the hospital (Smeltzer et al 2010:67). Assessing patient nutritional status and ensuring patients' adequate nutrition are key nursing responsibilities. According to the National Nutrition Council of Finland (2010:23), nursing staff in hospitals is responsible for the nutritional screening to detect patients at nutritional risk, nutritional assessment, and provision of nutritional care. In addition, it is nurses' duty to evaluate patients' nutritional needs and monitor patients' nutrient intake (National Nutrition Council of Finland 2010:23).

According to Bloomfield and Pegram (2012:53), nurses' role to meet the nutrition and hydration needs of patients is expressed in nutritional assessment and screening. In order to fulfill this responsibility, nurses need professional knowledge and skills in applying nutritional assessment of patients. Therefore, nutritional assessment is crucial for maintaining good quality of nutritional care on the wards. The application of nurses' pro-

fessional knowledge on nutrition is mediated and supported by nutrition recommendations and guidelines such as Nordic Nutrition Recommendations 2012 as well as Finnish Nutrition Recommendations 2014 and Nutritional care 2010 issued by the Finnish National Nutrition Council. A number of studies bring evidence on nurses' key role in nutritional care. Nurses hold important position that allows them to perform nutritional screening and assessment of patients admitted on the ward (Green & James 2013:212). Nurses are in position to implement nursing nutritional interventions into patients' nutritional care plans and also, to communicate information into the multiprofessional team engaged with patients' nutrition during the time of hospitalization. According to Fletcher and Carey (2011:615), nurses are primarily in position to establish patients' nutritional assessment and appropriate nourishing. Moreover, as Tappenden and colleagues insist (2013:148), each member of the team including nurses should participate to meet problems such as malnutrition.

In their review paper Green and James (2013:212) continue that although nurses' position carries responsibility on patients' nutritional screening on admission, recent data shows that patients might not been routinely screened. The authors discuss the precedence of other nursing tasks over nutritional screening. After investigating on possible barriers experienced by nurses, the authors conclude that in order to be performed, nutritional screening should be considered as necessary part of nursing assessment. (Green & James 2013:216-219) Based on previous research, Fletcher and Carey (2011:618-19) also raise the issue of the lower priority of the nutritional interventions among other nursing duties, and highlight the importance of nursing staff education and training for the provision of adequate nutritional care.

This final project looks at whether nurses on orthopedic wards possess sufficient amount of knowledge to assess the nutritional status of orthopedic patients. The focus is on oral nutrition of orthopaedic patients, hence enteral and parenteral nutrition are not in the scope of the current project. In this final project, a knowledge test is produced based on the results gathered from previous research on the matter. The ultimate goal of the final project is, via producing a knowledge test, to help nurses develop the nutritional care and hence, improve the overall nutrition among orthopaedic patients.

2 Key concepts

With respect to the findings presented in the relevant literature, this final project deals with a number of key concepts that are discussed below.

2.1 Nursing and orthopaedic patients

For the purpose of this final project, the profound definition that Barrett gives in her work is applied. Barrett defines nursing “as a basic science and the practice of nursing as the scientific art of using knowledge of unitary human beings who are in mutual process with their environments for the well-being of people.” (Barrett 2002:51)

The focus is on orthopaedic patients' nutritional assessment, thus another key term is 'orthopaedic patients'. Orthopaedic patients represent patients admitted on orthopaedic wards. This final project employs findings from research that deals with patients who had leg and arm fractures, hip fracture, neck of femur (NOF) fracture or were admitted for hip or knee replacement. In two of the cited studies the subjects were not orthopaedic, but other type of surgical patients.

2.2 Nutrition and nutritional status

In their article Fletcher and Carey (2011:615) cite Field and Smith's definition, which states that “nutrition is a process whereby food is taken into the body and broken down, allowing for a production in energy, necessary for all living cells to maintain their structure and function.” Williams and Schlenker (2003) define nutrition as the food intake and the extent it provides nutrients for the human body (Williams & Schlenker quoted in Bloomfield and Pegram 2012:53). Additionally, Bloomfield and Pegram (2012:53) based on Green (2011) underline that the adequate nutrition is fundamental for growth, repair, and energy supply to the body.

According to Fletcher and Carey (2011:615), diet representing balanced nutritional status contains all carbohydrates, proteins, fats, and dairy products. The authors continue that any imbalance of these components might lead to compromised nutritional status and subsequently, malnutrition (Lewis et al 2004 cited in Fletcher and Carey 2011:615). Hence, patient’s good nutritional status is expressed in adequate nutrition that comprises of all nutrients necessary for the normal body functions.

2.3 Nutritional care and nutritional risk

In their study Mowe and colleagues in collaboration with the Scandinavian Nutrition group (2008) give the following statement: “Nutrition is a vital component of health promotion and disease prevention.” (Mowe et al 2008:197.). Thus, the researchers underline the essential place of nutrition in nursing practice, as two of the fundamental nurses' responsibilities are to promote health and prevent illness (Fry & Johnstone 2008:68). Hence, in regard to health promotion and illness prevention ensuring good nutrition is embodied as a major nursing task. Therefore, nutritional care is essential element of nursing care.

Nematy, Hickson, Brynes, Ruxton, and Frost (2006:213) bring out the issue of “nutrition care plan which incorporates nurse-led interventions [...]”, i.e. nursing nutritional interventions are implemented in the overall patient's care plan. Therefore, nutritional care is a key term, without which the key terms explained later might not receive complete overview. According to Persenius, Hall-Lord, Bååth, and Larsson (2008:2126), nutritional care is a constituent of nursing care. The authors claim that ”the patients' nutritional nursing care is one of registered nurses’ (RNs) primary responsibilities.” Bjerrum, Tewes and Pedersen (2012:81) emphasize that nutritional care belongs to the realm of nurses' responsibilities. Thus, nutritional care for patients is important component of the overall nursing care and is expressed in nursing interventions implemented in patients’ nutritional care plans. Prominently, nutritional care is a fundamental nurses' responsibility.

As a whole, the relevant literature used for the purpose of this project does not provide strict definition of 'nutritional risk', but rather binds 'nutritional risk' to the key terms of 'malnutrition' and 'undernutrition' that are examined further. According to Fletcher and Carey (2011:615), based on the National Institute for Health and Clinical Excellence (NICE 2006), patients ”at risk of malnutrition include those who have eaten very little in the past five days, those with poor absorptive capacity or who have high nutritional losses, and individuals with increased nutritional needs.” In the introduction of their study, Corish, Flood and Kennedy (2004:134) point out: ”Screening for nutritional risk can be carried out by identifying characteristics which are known to be associated with nutritional

problems. It detects individuals who are at risk of becoming, or who are already undernourished" (Dougherty et al 1995 quoted by Corish et al 2004:134.). Nutritional risk might also be expressed as the "risk of deteriorating nutritionally" (Corish et al 2004:134).

2.4 Nutritional screening and nutritional assessment

'Nutritional screening' and 'nutritional assessment' (also found as 'nutrition status assessment') are interrelated terms. Based on the relevant literature collected for the purpose of this final project, nutritional screening usually refers to the initial assessment of patients on admission to the ward. Screening aims to detect patients at nutritional risk. In her paper Posthauer (2012:15) claims that every patient admitted to health care unit should be provided with initial nutritional screening which purpose is to identify patients at nutritional risk. The author also explains that nutritional assessment is the ongoing process of gaining information on which grounds the decisions on patient's nutrition are made (Posthauer, 2012:16). Nutritional assessment regards continual assessment of patients' nutritional status during their hospital stay. According to Bloomfield and Pegram (2012:54-55), through assessment nurses gather essential information that help them "plan, implement and evaluate patient care".

In order to aid the nutritional screening and assessment during hospitalization, number of different nutritional screening and assessment tools are available through the European Society of Parenteral and Enteral Nutrition (ESPEN) guidelines (Pedersen et al 2012:178). According to Persenius and colleagues (2008:2126), about seventy nutritional screening and assessment tools for identifying patients at nutritional risk already exist.

2.5 Malnutrition and undernutrition

Malnutrition and undernutrition are key terms upon which grounds most of the collected research is built. Understanding these terms determine the further understanding of the connection between nutritional assessment, nutritional care, and nurses' knowledge on nutrition. Posthauer (2012:15) in precise manner defines malnutrition as follows: "Malnutrition is a status of nutrition in which a deficiency (also called undernutrition) or excess, or imbalance of energy, protein and other nutrients causes measurable adverse effects on tissue, body structure, body function and clinical outcome." Fletcher and Carey

(2011:615) point out that malnutrition results from nutrient deficiency (Kozier et al 2008 cited in Fletcher & Carey 2011:615).

One of the most accurate definitions of the two terms is given by Tappenden and colleagues (2013). In their profound paper the authors underline that malnutrition is nutrition imbalance which affects patients that are either overweight or underweight. In the latter case, malnutrition is specified as undernutrition (Tappenden et al 2013:148). Most commonly, in the gathered literature either malnutrition or undernutrition is used as a preferred term depending on the purpose and the theoretical frame of the particular research. For the purpose of this final project, malnutrition is used to address nutritional imbalance among orthopaedic patients who might be both overweight and underweight, whereas undernutrition refers to patients who experience nutrient deficiencies.

3 Purpose, aim and study question

The purpose of this final project was to produce a knowledge test for nurses working in orthopaedic wards.

The ultimate goal is via applying the knowledge test to help nurses develop the nutritional care, hence improve the overall nutrition among orthopaedic patients.

The study question of this project is: What do nurses need to know in nutritional assessment?

4 Data collection and data analysis

4.1 Data collection

The search for relevant literature was done through CINAHL and Ovid Medline databases. The primary key words used in the searches are combinations of the terms “nutrition”, “orthopaedic patients”, “nutrition(al) assessment”, “nutrition screening”, “nutritional risk”, “nutritional knowledge”, and ”nurses”.

The searches in Ovid Medline were performed with the following limitations: articles published in English language and articles published between 2002 and 2014. Some of the articles found through Ovid Medline searches were not available with full text, however their full versions were found via CINAHL. The searches through CINAHL database included the following limitations: articles with available full text, articles published in academic journals, articles published between 2002 and 2014, and articles written in English language.

Overall, among the great deal of hits, only sixty-eight articles possessed relevancy in terms of title. Accurate draft of the abstracts aided the process of picking the relevant twenty-three articles as total from both Ovid Medline and CINAHL database searches. Many articles chosen based on title and abstract coincided in the hits of the two data bases. Finally, the total amount of articles selected based on text was twenty including both research and non-research articles. The non-research articles contain review articles as well as pilot projects. The results of the database searches are found in Table 1.

Table 1. Database searches

Database	**Key words**	**Selected based on title**	**Selected based on abstract**	**Selected based on text**
Ovid Medline	1. Nutrition AND orthopaedic patients 2002-2014 English	7	4	4
Ovid Medline	2. Nutritional assessment AND orthopaedic patients 2002-2014 English	same	same	same articles
Ovid Medline	3. Nutritional risk AND orthopaedic patients 2002-2014, English	same	same	same as search 1 and 2
Ovid Medline	4. Nutrition screening AND orthopaedic patients 2002-2014, English	same	same	same as previous searches
Ovid Medline	5. Nutritional assessment OR nursing OR orthopaedic patients 2002-2014, English	8	same	same as search 3
Ovid Medline		**15**	**4**	**4**
CINAHL	1. Nutrition AND orthopaedic patients AND nursing 2003-2014	18	7	7

CINAHL	2. Nutrition OR orthopaedic patients OR nursing 2002-2014	22	5	2
CINAHL	3. Nutritional screening OR orthopaedic patients 2003-2014	10	5	5
CINAHL	4. Nutritional knowledge AND nurses 2003-2013, English	3	2	2
CINAHL		**53**	**19**	**16**
In total		**68**	**23**	**20**

Inclusion criteria applied to both database searches regards articles in nursing science and nutrition science fields, although three articles represent research done in the medical science field. Other inclusion criteria were surgical nursing/medical-surgical nursing articles, literature review articles as well as research articles. The applied exclusion criteria concerns non-academic journal articles, articles which content did not include any surgical patient groups, non-English language articles, articles written before 2002, and articles coming from scientific fields different from nursing science and nutrition. Nevertheless, as already specified three of the chosen articles are exception to this exclusion criteria due to high relevancy to the themes discussed in this final project.

Both research and non-research articles were collected for the background of this final project. The total number of articles chosen based on text is 20, among which there are six non-research articles and fourteen research ones. The relevant articles used for the results and the design of the knowledge test are research articles only. Information on the chosen articles is found in Table 2.

Table 2. Articles chosen based on text

	OvidMedline	**CINAHL**	**In total**
Non-research articles	0	6	**6**
Research articles	7	7	**14**

4.2 Data analysis

After selecting the relevant articles based on text, a subsequent literature review was applied as a method to inspect the content of the chosen academic works. All the 20 articles were thoroughly read and assessed. The review of the gained research material was fundamental for determining the major categories in regard to the study question of this final project. The analysis of the articles' contents was completed by applying the principles of the qualitative content analysis. According to Elo and Kyngäs (2008:107), the qualitative content analysis is one of the methods for processing qualitative data and is largely used in nursing research. The researchers continue that qualitative content analysis might be applied either inductively or deductively (2008:109). “If there is not enough former knowledge about the phenomenon or if this knowledge is fragmented, the inductive approach is recommended” (Lauri & Kyngäs 2005 cited in Elo & Kyngäs 2008:109.). Elo and Kyngäs (2008:109) continue that the principle of the inductive content analysis is to proceed from specific data toward general one. In this final project an inductive approach was chosen to analyze and categorize the collected data. “The purpose of creating categories is to provide a means of describing the phenomenon, to increase understanding and to generate knowledge” (Cavanagh 1997 cited in Elo & Kyngäs 2008:111.).

Hence, a thorough classification of the data was carried out in order to determine the major categories for the study question of this final project. In the analysis process, each article’s content was read, analyzed, and interpreted in regard to its purpose, research question, participants, methodology, and results. Systematic information of the research articles’ purpose, participants, methodology, and results is found in Table 3, Appendix 1. Subsequently, the data was initially grouped into four major categories based on the purposes, main themes, and results of the studies. These four categories are presented in details in the following Results section. Finally, the main conclusions of each research article were analyzed in the same manner via applying inductive content analysis in order to answer the study question of this final project.

5 Results

The following paragraphs present the classified data derived from the analysis of the research articles. The classification is expressed in four major categories: nutritional assessment and nutritional care, nurses' knowledge in nutritional assessment and nutritional care, nurses' perceptions of nutrition and nutritional assessment, and role of biochemical parameters in nutritional care.

5.1 Nutritional assessment and nutritional care

Bååth, Wilde-Larsson, Idvall, and Hall-Lord (2010) conducted a study to describe and compare registered nurses' (RN) and enrolled nurses' (EN) assessments of postoperative pain, risk of malnutrition and pressure ulcers in patients with hip fracture. For the purpose of this final project the focus is on the results that concern only the nutrition aspect of the cited study. Thirty-four RNs and forty-three ENs participated in the study that took place in orthopaedic wards. Mini Nutritional Assessment-short form (MNA-SF) tool was applied to assess patients at risk of malnutrition. Additionally, Modified Norton scale (MNS) used in the study contains an item regarding food intake.

The participants carried out assessments on eighty-two patients with hip fracture, aged sixty-five or older. The results showed that RNs recognized eighty-four per cent of the patients to be at possible risk of malnutrition, whereas ENs pointed out ninety per cent of the patients to be possibly malnourished. According to the researchers, there was no significant differences between the MNA-SF score and the body mass index (BMI) score assessments of the two groups of professionals. Further, more enrolled nurses than registered nurses determined that patients had weight loss and moderate loss of appetite, while more RNs than ENs assessed that patients expressed no loss of appetite and had no weight loss. (Bååth et al 2010:35) Finally, the study confirms the lack of statistically significant difference between RNs' and ENs' perceptions of applying MNA-SF and MNS assessment tools (Bååth et al 2010:37).

Bååth and colleagues (2010:37) conclude that for establishing patients' nutritional care plan it is fundamental that each element of MNA-SF is properly assessed. Due to the high prevalence of patients at risk of malnutrition, the study emphasizes the importance of applying nutrition assessment tools to identify patients at nutritional risk (Bååth et al 2010:39).

Corish, Flood, and Kennedy (2004:133-134) carried out a comparison between two nutritional risk screening tools, the Nutrition Risk Index (NRI) and the Nutrition Risk Score (NRS), in order to evaluate their efficacy in identifying patients at risk of undernutrition on admission to hospital. Undernutrition was defined as body mass index (BMI) lower than 20 kg/m² and triceps skinfold thickness (TSF) or mid-arm muscle circumference (MAMC) below the 15th percentile (Corish et al 2004:136). The study also aimed to test whether there was difference in the effectiveness of the two screening tools between the fraction of patients aged sixty-five years and older and those ones aged below sixty five years. In addition, Corish and colleagues (2004:134) underline that the NRI applies serum albumin values and weight loss as percentage from patient's weight, whereas NRS uses weight loss in kilograms and duration over the last three months, food intake including appetite and ability to eat, as well as stress factors such as disease or condition affecting nutrition.

Three hundred fifty-nine patients were assessed for the purpose of the study. Patients' obtained anthropometric measures comprised of weight and height, BMI, TSF and MAMC. Additionally, serum albumin values were collected. In regard to NRI patients were classified as not at nutritional risk, at mild nutritional risk, or at severe nutritional risk. In regard to NRS they were divided into patients at low nutritional risk, at moderate one, or at high nutritional risk. (Corish et al 2004:135-136)

The results from patients' assessments showed that 13,6 per cent of all patients were determined as undernourished in accordance with the definition of undernutrition used in the study. The study affirmed that there was no difference between the fraction of undernourished patients at age sixty-five or older and the one comprised of patients younger than sixty-five years. (Corish et al 2004:136) Furthermore, NRI tool determined fifty-seven per cent of patients were at no nutritional risk, thirty-eight per cent were at mild risk, and only five per cent were at severe nutritional risk. Likewise, NRS tool assessed fifty-four per cent of patients were at low nutritional risk. However, NRS considered seventeen per cent were at moderate and twenty-nine per cent were at high nutritional risk. There was considerable difference between the two screening tools on the subject of the risk degree. (Corish et al 2004:136-137) The authors continue that both tools exhibited misclassification. Among the forty-nine undernourished patients, NRS determined eighteen per cent of them at low nutritional risk, while NRI pointed thirty-three per cent of them at no nutritional risk. (Corish et al 2004:137)

Based on the results, Corish and colleagues (2004:137) claim that serum albumin values were in normal range in seventy-one per cent of the undernourished patients. Further, both NRI and NRS screening tools measured undernutrition accurately in the greater part of elderly patients. NRI detected eighty-nine per cent of undernourished patients, while NRS identified all undernourished patients. The NRI sensitivity did not perform well in relation to undernourished elderly under sixty-five years, detecting only fifty-five per cent of them. NRS brought evidence of higher accuracy in identifying younger undernourished elderly patients displaying result of seventy-one per cent correctly classified. (Corish et al 2004:137)

Corish and colleagues (2004:137) claim that accurate assessment of nutritional risk should take place over longer period. The researchers (2004:138-139) recommend evaluation and documentation of patient outcome that resulted from the nutritional screening and performed nutritional interventions as part of patient care as well as further investigation on the subject.

Nematy, Hickson, Brynes, Ruxton, and Frost (2006) carried out a research on the nutritional state and nutritional support for patients with fractured neck of femur (NOF) during hospitalization on an orthopaedic ward. Twenty-five patients were recruited for the study. Patients' food intake was examined by estimating patients' total energy requirement, calculating patients' mean daily energy and nutrient intake, and recording patients' dietary intake over three days in the second postoperative week. The risk of malnutrition was assessed via the hospital's own screening tool. Additionally, patients' mid-arm circumference and body mass index (BMI) were measured altogether with estimation of patients' mobility via the Elderly Mobility Scale (EMS). (Nematy et al 2006:210-211)

The results bring evidence for the markedly lower BMI in the studied patient group. Although the authors underline that BMI is not the most accurate index for risk of malnutrition, they point out that recent research suggests that lower risk of mortality correlates with BMI higher than previously noticed in patients aged seventy-five and over. (Nematy et al 2006:213) Malnutrition risk assessment performed by using hospital's local assessment tool showed that fifty-six per cent of the patients on admission were at moderate or high risk of malnutrition. Moreover, the percentage increased to sixty-eight during patients' hospital stay. The study revealed that during the second postoperative week the mean daily energy intake was fifty-nine per cent of the estimated energy requirements.

Furthermore, due to the fracture and consecutive surgical operation, patients' albumin, total protein, and haemoglobin dropped below normal ranges. (Nematy et al 2006:213)

According to Nematy and colleagues (2006:213), for this reason, patients at high nutritional risk need to be referred to a dietitian, while nutritional care plan is recommended for patients at moderate nutritional risk. Nutritional care plan involves nursing interventions such as encouraging patients to eat during meal times and preparing protein drinks. The researchers observed that nevertheless, thirty-six per cent of the patients at high risk of malnutrition were omitted from referring to dietitian. The patients who met the dietitian received high-energy food. Some of the patients were prescribed supplemented liquids. (Nematy et al 2006:213)

The study compared two groups of patients: on one hand, at risk patient group that consisted of seventeen patients, and on the other hand, not at risk patient group that included eight patients. The comparison displayed that the patients at nutritional risk had lower BMI, mean weight, and higher C-reactive protein measures on admission. In addition, this patient group demonstrated lower energy intake during the second postoperative week comparing to the not at risk patient group. (Nematy et al 2006:214)

In conclusion, Nematy and colleagues (2006:215) emphasize that fractured NOF patients require longer hospital stay, are more dependable on mobility aids on discharge from hospital, would need ongoing physiotherapy, which would increase the total cost of treatment. Further, the researchers (2006:217) insist that lack of consistent nutritional screening of orthopaedic patients was found to be the cause of failure in referring patients to dietitian and further worsening of patients' nutritional status. Hence, the study suggests increase in nutritional screening and nutritional supplementing and monitoring of NOF patients. The study also brings out the necessity to consider patients' metabolic changes as well as changes in appetite. (Nematy et al 2006:217)

Olofsson, Stenvall, Lundström, Svensson, and Gustafson (2007) also conducted a study on elderly femoral neck (NOF) fracture patients. The research team aimed to investigate the impact of nutritional interventions on postoperative complications during hospital stay as well as on nutritional status at follow-up of four months. According to Olofsson and colleagues (2007:2028), elderly population is inclined to decrease in taste and smell, teeth impairment, physical deterioration, and isolation and grief, which might result in insufficient nutrient intake, respectively malnutrition. Among other nutritional risk factors

are different medical conditions, poverty, dementia, and depression. Previous research among elderly NOF patients has shown that nutritional interventions reduce the postoperative complications in this group of patients. (Olofsson et al 2007:2028-2029)

A total number of one hundred fifty-seven patients participated in the study. They were divided into two groups: an intervention group of eighty-three patients and a control group of seventy-four patients. The results revealed that the greater part of patients were malnourished or at risk of malnutrition on admission. Mini Nutritional Assessment (MNA) tool showed low scores for fifty-eight per cent in the intervention group and sixty-four per cent in the control one. The low MNA scores were associated with postoperatively developed delirium and decubitus ulcers. (Olofsson et al 2007:2033) Hence, the study brings evidence of prevailing malnutrition among elderly hip fracture patients that relates to postoperative complications such as delirium and pressure ulcers leading to prolonged hospitalization (Olofsson et al 2007:2035-2036).

According to Olofsson and colleagues (2007:2035), the applied nutritional interventions might have influenced patients positively resulting in less delirium, fewer pressure ulcers and shorter hospital stay. However, the researchers conclude that the interventions did not considerably affect patients' nutritional status, thus the nutritional status of a great share of the patients did not improve during the follow-up (Olofsson et al 2007:2035). The study suggests that male hip fracture patients exhibited better outcome in comparison with female patients regardless the implementation of nutritional interventions (Olofsson et al 2007:2037).

Based on previous research showing that malnutrition is a serious problem among hospitalized orthopaedic patients that might lead to postoperative complications such as delayed wound healing and infection, Ozkalkanli, Ozkalkanli, Katircioglu, and Savaci (2009:274-275) compared two nutritional assessment tools, the Subjective global assessment (SGA) and Nutritional Risk Screening 2002 (NRS 2002), among two hundred twenty-three patients in regard to nutritional status and prediction of developing postoperative complications. The SGA tool identified thirty-three per cent of patients were malnourished on admission, whereas NRS 2002 affirmed that twenty-three per cent of patients suffered from malnutrition. The assessment via SGA detected severe malnutrition in six per cent of the patients. According to NRS 2002 only one per cent of all patients were considered at high risk of malnutrition. During the study, nine in-hospital patient deaths occurred. SGA tool measured that all nine patients were malnourished, while

NRS 2002 confirmed that eight out of these nine patients were malnourished. (Ozkalkanli et al 2009:276-277)

With respect to the postoperative complications, such were developed in forty patients, ten of whom had more than one complication. SGA indicated that complications occurred in thirty-five per cent of the patients in malnourished group, while in the non-malnourished group only nine per cent had postoperative complications. Similarly, NRS 2002 declared thirty-eight per cent of patients at nutritional risk developed complications, while about one third less patients from the non-at risk group were affected by complications. (Ozkalkanli et al 2009:277) Both assessment tools demonstrated that the prevalence of postoperative complications was higher among orthopaedic patients who were malnourished or were at risk of malnutrition on admission (Ozkalkanli et al 2009:278).

Ozkalkanli and colleagues (2009:278) bring out that the World Health Organization's definition of malnutrition, in which body mass index (BMI) below 18,5 kg/m^2 indicates malnutrition, might fail to identify all patients at nutritional risk, thus leading to misclassification. Hence, the use of nutritional assessment tool in addition to BMI is recommended to classify patients at nutritional risk. The authors point out that Nutritional Risk Screening 2002 (NRS 2002) contains item of disease effect on nutrition and overall, possesses better predictability of postoperative complications comparing to Subjective Global Assessment (SGA). (Ozkalkanli et al 2009:278)

Pedersen (2005:247-248) investigated the effect of nutritional care involving the active participation of patients. The assumption was that such a nutritional care might help improve the protein and energy consumption among elderly orthopaedic patients. The participants in the study were admitted for hip or knee replacement, or hip fracture surgeries. A total number of two hundred fifty-three patients aged sixty-five and older were enrolled for the study. They were divided into two, a control group of one hundred forty-two patients and correspondingly, an intervention group of one hundred eleven patients. The nutritional interventions involving patients actively in the care were carried out in the intervention group. The nutritional care plan comprised of leaflets concerning patients' preoperative nutrition sent by mail prior to hospital admission, interviews on admission, calculation of protein and energy requirements, documentation of dietary intake and assessment of the need of related nursing care on daily basis, as well as provision of information and patient education on food choices. (Pedersen 2005:249)

Further, the weight and height were measured on admission for elective patients, and within the first three postoperative days for trauma patients. Recording of patients' dietary intake around the clock from the first postoperative day until the day before discharge from hospital was also done. The food and fluid intake were accurately documented. The food protein and energy was calculated by clinical dietitian. Basic energy expenditure (BEE) for each patient was also calculated. Bed-bound patients, patients mobilized on the fourth postoperative day, and patients with temperature higher than 38 degrees Celsius received BEE with higher energy requirements. Protein intake was adjusted as 1,5 g protein per kilogram per day. (Pedersen 2005:249-250)

On the average, the energy intake in the intervention group was twenty-three per cent higher than in the control group which had standard care only. The protein intake was forty-five per cent higher in the group receiving nutritional interventions in comparison to the control group. (Pedersen 2005:250-251) The evidence derived from the results affirms that the nutritional interventions with active involvement of patients demonstrated effectiveness in regard to the increase of protein and energy intake in orthopaedic patients during postoperative period (Pedersen 2005:247).

5.2 Nurses' knowledge in nutritional assessment and nutritional care

In their study on how a training programme influenced nurses' knowledge and awareness of nutrition, Bjerrum, Tewes and Pedersen (2012) interviewed sixteen registered nurses from surgical or medical wards who were responsible for the nutritional care. A training programme on nutrition took place for twelve month period. The participants in the study answered questions before and after the training programme. In the result part of the study five themes of analysis were determined: role as nurse specialists, understanding clinical nutrition, approach to clinical nutrition, management of assessing and monitoring clinical nutrition, and expectations towards and benefits of the training programme. (Bjerrum et al 2012:81; 83-86)

In terms of role as nurse specialists the results revealed that after the training programme, the nurses were more aware of their role as specialists in nutrition. Nurses found that this specific role makes easier to advance the nutritional care. Further, in terms of understanding clinical nutrition, the knowledge that nurses gained throughout the programme helped them feel more confident and more aware of their responsibility for detecting patients at nutritional risk. (Bjerrum et al 2012:83-85)

The participants emphasized on the nutrition as vital part of the care, which deserves higher priority. Nevertheless, both before and after the training programme, nurses rated nutrition lower than the other nursing tasks, mainly due to lack of time. (Bjerrum et al 2012:85) In regard to the approach to clinical nutrition, although after the programme nurses were more aware of how to advise colleagues on the importance of ensuring nutrition, they found it difficult to keep nutrition into focus due to workload. Nurses' awareness about the importance of snack for patients' energy needs increased. Additionally, nurses endeavor to involve the patients in the nutritional care by providing information about the energy requirements. (Bjerrum et al 2012:85-86)

In terms of assessment and monitoring clinical nutrition, after the training programme nurses achieved better understanding on the registration screening forms according to which the patients should be assessed within twenty-four hours after admission via an interview including questions about patients' nutrition, weight, weight loss, and food intake. However, nurses admitted they might need more clarification on how extensive the questions should be. (Bjerrum et al 2012:86) Regarding nurses' expectations towards and benefits of the training programme, the results of the study showed that nurses were not completely satisfied and wished to learn more about nutrition, channelling information, and advising colleagues. Overall, subsequently to the training programme, nurses improved their knowledge on nutrition and were capable in doing searches for evidence-based literature. (Bjerrum et al 2012:86)

Nurses demonstrated increased awareness of dealing with malnutrition, i.e. identifying undernourished patients' energy needs, monitoring patients' energy intake, and understanding causes of decreased appetite in patients. The training programme helped nurses employ more nutritional interventions such as discussing with patients about lack of appetite and preferred food and drinks, and encouraging patients to eat and drink. Providing relevant information to patients and colleagues also reflected the improved nursing nutritional knowledge. (Bjerrum et al 2012:87) Nevertheless, the study reveals that nurses continue prioritizing nutritional care lower than other nursing tasks (Bjerrum et al 2012:87). In conclusion, Bjerrum and colleagues (2012:88) state that nurses might need extra education on broader aspects of nutritional care.

Pedersen, Tewes, and Bjerrum (2012) conducted a study to test whether a nutritional guidelines training programme for nurses would help reduce the risk of undernutrition

among surgical patients by improving staff ability to identify patients with eating difficulties, increase patients' knowledge on food, and stress on snacks between the meals. According to Pedersen and colleagues (2012:178), about forty per cent of patients admitted to hospital are at risk of undernutrition. The researchers emphasize that undernutrition might cause additional complications during hospital stay, raised costs, increased mortality, and lower quality of life (Pedersen et al 2012:178).

Based on previous research on the insufficient nurses' knowledge in nutrition and nurses' need for nutritional guidelines, Pedersen and colleagues established a nutritional training programme for nurses in order to implement nutritional guidelines following ESPEN recommendations (Pedersen et al 2012:179). The programme provided one-year education, after which nutritional nurse practitioners (NNP) were assigned to each ward holding the responsibility for implementing the nutritional guidelines on the ward. Furthermore, participating patients filled a questionnaire concerning eating difficulties, requests for meals, knowledge on food choices, receiving of snacks, and evaluation of assistance given by the nurses. (Pedersen et al 2012:180)

The pre-test phase of the study in 2005 involved forty surgical patients, whereas the post-test in 2006 enrolled forty-nine surgical patients. The results of the study revealed that sufficient amount of patients were at nutritional risk. In regard to patients' eating difficulties, after the training programme, the number of patients who reported eating difficulties to the nursing staff markedly increased. In 2006 the food received was to greater degree aligned with patients' orders, in spite of the fact that one patient received food difficult to chew and one other patient did not receive the desired food. (Pedersen et al 2012:180)

The implementation of nutritional guidelines via a nutritional training programme resulted in increased number of patients who discussed their eating difficulties with the staff. The program also had positive impact on more patients receiving appropriate food and assistance during mealtimes. With respect to food choices and snack intake, patients' knowledge also raised, hence, improving their nutritional intake. (Pedersen et al 2012:178) Nurses achieved more awareness on how to deal with problems regarding patients' nutritional intake (Pedersen et al 2012:184).

In a study conducted by Mowe, and colleagues together with the Scandinavian Nutrition group (2008), a questionnaire was distributed to 6000 doctors and 6000 nurses in three

counties. The overall response rate was about 37% which refers to the number of 4512 doctors and nurses who answered the questions. The nurses' response rate was higher than the one of the doctors. The questionnaire comprised of items on attitudes to own nutritional knowledge, nutritional problems, and knowledge in nutritional treatment. (Mowe et al 2008:197)

The results displayed that insufficient knowledge, lack of interest, and lack of responsibility are the most common declared reasons for inadequate nutritional practice. Reported low nutritional knowledge correlated with lack of nutritional assessment techniques, difficulty in identifying undernourished patients, and difficulty organizing nutritional programme. Good nutritional practice was associated with reported good nutritional knowledge. Furthermore, respondents who described they possessed good education in nutrition demonstrated better knowledge on the items related to nutritional problems than their colleagues who stated insufficiency in their nutritional education. (Mowe et al 2008:198)

In respect to ESPEN guidelines for good nutritional care, twenty-five per cent of the participants described difficulties in identifying undernourished patients, half of the respondents met problems with calculating patients' energy requirements, and forty per cent experienced lack of technique for detecting malnourished patients. Sixty per cent of the doctors and nurses encountered challenges in organizing nutritional programme. (Mowe et al 2008:198-199) Mowe and colleagues (2008:201) conclude that nurses lack sufficient knowledge in nutritional screening and assessment, in spite of the existing nutritional guidelines and recommendations. Based on evidence, the researchers suggest that further nutritional education is needed to improve nurses' knowledge and skills in nutrition (Mowe et al 2008:202).

A study by Raja and colleagues (2008:27) reports on previously implemented malnutrition screening on patients’ admission, which did not meet high compliance on the wards. Hence, the researchers investigated nurses' views and practices in terms of using two nutritional screening tools, the Malnutrition Screening Tool (MST) and the Malnutrition Universal Screening Tools (MUST) in two medical and two surgical wards. Fifty-four registered nurses took part in this study. (Raja et al 2008:28)

Raja and colleagues (2008:29) continue that according to the hospital policy, nutrition screening forms should be included in every patient record and patients should be assessed within twenty-four hours after admission. However, there was considerably large variety in the compliance, showing differences between the wards. The use of the two screening tools remained poor. Moreover, the research team concludes that such low rates of nutritional screening demonstrate that the share of patients at nutritional risk is bigger than the one actually identified by nurses. The authors emphasize that low nurses' compliance with nutritional screening process results in overlooking malnourished patients. (Raja et al 2008:29-30)

The results of the study define several reasons for the low screening rates, among which are the priority to other nursing tasks, lack of evidence-based practice, and nurses' perceptions involving the use of professional judgment rather than the use of nutritional screening tools for identifying patients at nutritional risk. The main reason for the low priority of nutritional care is competing nursing tasks and considerations that other nursing duties are of higher importance than nutrition. (Raja et al 2008:30) Another difficulty derives from nurses' perception that there is no necessity of screening every patient. Thus, some nurses used their professional judgment based on patient' weight and appearance instead of applying a nutritional screening tool. (Raja et al 2008:30) This practice resulted in huge difference between the number of patients at risk of malnutrition assessed by nurses and the number of patients assessed by dietitians (Raja et al 2008:31).

The study affirms the benefits from using the appropriate nutritional screening tool. According to the researchers (Raja et al 2008:31-32), difficulty in completing MUST form, lack of possibility for verbal communication with patients, lack of experience and enough preliminary training were all stated by the nurses as barriers in front of using the nutritional screening tools. Additionally, staff workload and some organizational issues were also mentioned as possible obstacles (Raja et al 2008:31-32).

Raja and colleagues (2008:32), based on the low rates of nutritional screening in their study, conclude that evidence-based screening tools do not get utilized directly into nursing practice, but rather barriers such as lack of knowledge and skills in nutrition should primarily be resolved. The researchers point out that nutritional screening efficiency suffers from nurses' insufficient knowledge and skills on the subject, indicating the need of nursing staff education (Raja et al 2008:33).

5.3 Nurses' perceptions of nutrition and nutritional assessment

Bååth, Wilde-Larsson, Idvall, and Hall-Lord (2012:3-4) carried out a research to investigate how registered nurses (RN) and enrolled nurses (EN) perceive the assessment of patients' pain, nutrition, and skin as these three represent essential components of nursing care. For the purpose of this final project, the focus is only on nutrition management as a major domain of nursing care. As Bååth and colleagues (2012:4) mention, it is important to assess patients' risk of malnutrition. Although both international and local nutritional clinical guidelines exist, malnutrition continues to be present among orthopaedic patients (Bååth et al 2012:5).

Fifty RNs and sixty-one ENs took part in the study. Great part of the nurses worked on orthopaedic wards. (Bååth et al 2012:5) The results highlight one major theme, which was defined by the researchers as blurring of boundaries between the two professional groups in regard to patients' nutritional assessment. Bååth and colleagues (2012:6) point out that evidently, there were no clear margins determining which professionals execute the assessment and also, in which way the assessment is completed. Four categories were outlined in the study: nurse-patient interaction, using oneself as a tool, collaboration with colleagues, and listening to patient's significant others. In the frame of each category both common features and specifics of the RNs and ENs were described (Bååth et al 2012:6).

The results displayed that RNs assessed patients initially upon patients' admission, while ENs did the first assessment during the time of care provision. RNs considered important to assess patients' food and fluid intake and discuss with patients possible obstacles during meals, i.e. swallowing difficulties. For detecting risk of malnutrition, registered nurses used Mini Nutritional Assessment (MNA) tool, claiming that it might be useful for determining nursing interventions. Registered nurses underlined the importance of ensuring patient safety and paying attention at patients' opinions. (Bååth et al 2012:7-8)

Bååth and colleagues (2012:8) put emphasis on the observations as a method to assess patients. The nurses pointed out that observations on patients' weight gain or loss is done also at patients' bedside (Bååth et al 2012:8). Furthermore, care plans are built upon assessments and both written and verbal reports. The study results also reveal that RNs are assigned to and therefore, bear responsibility for documenting all the assess-

ments to patients' records. Finally, RNs reckoned listening to patients' relatives was essential in terms of receiving relevant information that concerns patients' care, for example eating habits. (Bååth et al 2012:9) The research team derives conclusion on the dimmed boundaries between registered nurses' and enrolled nurses' (ENs) assessments. The study recommends interactive training in order to enhance both RNs' and ENs' perceptions and knowledge in nutritional assessment, claiming that continuing education comes to great importance in nursing. (Bååth et al 2012:12)

Another research conducted by Khalaf, Berggren and Westergren (2009:6) also employs qualitative methods in order to investigate nurses' and nursing assistants' experience of and ethical reflections on nutritional care for undernourished patients. The researchers involve the nursing ethics perspective to explore the views of eight registered nurses and five nursing assistants working in orthopaedic wards. Based on the gathered data, the research team defined three major categories of experiences: to be frustrated in nursing, to experience joy in nursing, and undernourishment is taboo. The narratives of the participants revealed difficulties in measuring each patient's weight on admission due to mobility limitations caused by the fracture. (Khalaf et al 2009:8)

The results of the study affirm that frustration in nursing relates to the experience of stress caused by poor work organization including lack of clear guidelines for staff responsibilities. It occurred that nutrition of patients was left aside on behalf of the urgent trauma before the surgery and patient mobilization and pain management after the operation. Preoperatively as well as postoperatively the nutritional status of patients was not improved due to lack of focus on nutritional care. In addition, the participants pointed out the poor follow-up of undernourished patients' nutrition. Simultaneously, the nurses pointed out that the organization suffers from the lack of competent dietician. (Khalaf et al 2009:9) Another reason for frustration was the stress caused by patients' short hospitalization as well as lack of staff. Colleagues' rigidity and inadequate co-operation on patient nutritional care and also, new suggestions on nutrition improvement were also declared factors for frustration. (Khalaf et al 2009:10)

In the discussed study the second category was defined as the experience of joy in nursing. It was characterized by decreased stress at work, possibility to build up trustful relationship with patients, and ensuring pleasure during meal times. Some of the nurses underlined that creating comfortable environment and being reliable for the patients is a

prerequisite for establishing good nurse-patient relationship. A trustworthy, knowledgeable staff was described as capable in influencing patients' situation in regard to patient nutritional care. (Khalaf et al 2009:12) Ensuring pleasant atmosphere during meal times in order to motivate patients towards achieving good nutritional status was considered of high importance by many nurses. Considering patient cultural differences and special food requirements as well as managing pain before meal and comfortable position at the table were also stated to be factors for ensuring pleasant mealtime. (Khalaf et al 2009:13) Undernourishment as taboo indicated the view of nurses that patients were undernourished before admission to the orthopaedic ward. Nurses' statements involved guilt and self-accusation causing rejection of patient undernutrition as a problem. Such experiences brought ethical dilemmas to the nurses. (Khalaf et al 2009:14)

In their study Khalaf and colleagues (2009:17) present nurses' low compliance with existing nutritional guidelines for nutritional screening of orthopaedic patients. Work-related stress and lack of joy at work, as well as denying undernourishment among patients explain the lack of efficient screening. The researchers imply that before introducing guidelines, it is important to investigate nurses' attitudes and perceptions. The study suggests accent on patients' individual needs and priority to nutritional care in the context of multiprofessional team work. (Khalaf et al 2009:17)

Persenius, Hall-Lord, Bååth, and Wilde-Larsson (2008:2127) claim that in preventing and treating malnutrition it is important to identify malnourished patients and patients at risk of malnutrition. Based on nurses' responsibility for assessing patient nutritional status, identifying patients at nutritional risk, and providing nutritional care, the research team conducted a study to inspect the perceptions of chief nurses (CNs) and registered nurses (RNs) of patient nutritional assessment and nutritional assessment/screening tools. Investigating RNs' perceptions of documentation regarding patient nutrition was also in the scope of the study. (Persenius et al 2008:2125-2126) In total, one-hundred seventy-three nurses were interviewed, from whom one hundred thirty-one RNs and forty-two CNs (Persenius et al 2008:2127).

In regard to the prevalence of malnutrition among patients, both CNs and RNs perceived that there was a large variety of malnourished patients ranging from forty-three to eighty-seven per cent depending on the type of facility. One-hundred and fifteen nurses reported that not all patients were nutritionally assessed. Most of the nurses assessed patients on admission and/or during hospital stay, though rarely at discharge. (Persenius

et al 2008:2129) With respect to the use of specified nutrition assessment tools, the majority of the nurses did not apply any specified tool. Likewise, sixty-six per cent of the participants declared that there were no guidelines on malnutrition available. (Persenius et al 2008:2129-2130) Persenuis and collegues (2008:2130) present results showing that the greater part of the nurses documented nausea and/or vomiting, ability to eat and drink, diarrhoea, and swallowing and chewing difficulties. On the contrary, underweight and overweight, body mass index (BMI), subcutaneous fat and muscle mass, energy intake as well as mental status and metabolic changes did not prevail in the nurses' documentation (Persenius et al 2008:2130).

The study by Persenius and colleagues (2008:2134) brings out that regardless the high prevalence of malnutrition, nursing staff failed to assess each patient and document patients' nutritional data. The authors conclude that the application of nutritional guidelines and nutritional screening and assessment tools by nursing staff was poor and thus, clarification of nursing nutritional responsibilities and improved nurses' evidence-based knowledge in nutrition are suggested (Persenius et al 2008:2134). The study strongly recommends the use of nutritional guidelines and places accent on the proper assessing and documenting patients' nutritional status (Persenius et al 2008:2134).

5.4 Role of biochemical parameters in nutritional care

A study by Zorrilla, Gomez, Salido, Silva, and Lopez-Alonso (2006) investigated the serum zinc level as indicator for delayed wound healing in patients undergoing total hip arthroplasty. The study involved eighty patients aged between thirty-five and eighty-five years. Patients with concurrent diseases such as insulin-dependent diabetes, rheumatoid arthritis, and renal impairment that might affect the wound healing were not included in the study. The researchers accented on that delayed surgical wound healing is a risk factor for prosthetic infection, prolonged hospital stay, and increased costs. Hence, predicting wound delay in this patient group might help avoid postoperative complications by timing of the surgery intervention. (Zorrilla et al 2006:119)

In order to affirm the high reliability of serum zinc value for determining the risk of delayed wound healing postoperatively, the researchers measured patients' preoperative serum zinc levels along with patients' preoperative nutritional status comprised by serum albumin, serum transferrin, and total lymphocyte count values. In the study an indirect

method of assessing wound healing was applied. Two consecutive positive bacterial cultures swabbed from the wound were considered confirmation of wound infection. (Zorrilla et al 2006:120) Overall, 18,8 per cent of patients exhibited delayed wound healing, among whom 3,7 per cent developed superficial wound infection. The results revealed that the patients with delayed wound healing stayed longer in hospital in comparison with the patients who had no delay in wound healing. The study found statistically significant correlation between the low preoperative serum zinc level and the postoperative delay in wound healing. Preoperative deficiency of serum zinc level as indicator for delayed wound healing was confirmed by the study. Hence, total hip replacement surgeries might be timed in order to decrease the postoperative risk of delayed wound healing. (Zorrilla et al 2006:120-121)

6 Discussion

6.1 Ethical considerations

According to the Finnish Advisory Board of Research Integrity (2012:30), a research should lie upon the principles of research responsible conduct in order to contain the necessary research ethics. “In order for research to be ethically acceptable and reliable and for its results to be credible, the research must be conducted according to the responsible conduct of research.” (Finnish Advisory Board of Research Integrity 2012:30.). Some of the principles of the responsible conduct, relevant to this final project, concern the scientific criteria of the collected data, the provision of credit to the work of other researchers, and the conflict of interest.

This final project deals with non-subject research. The project applies analysis of previously conducted research in the fields of nursing, nutrition, and medical sciences. Therefore, the principles, upon which the ethical consideration of this final project are grounded, concern the scientific criteria and ethics of the collected data, and the accuracy of the analysis of the previously done research.

Furthermore, by following the guidelines for correct citing and avoiding plagiarism, this final project gives credit to the scientific achievements of the researchers, whose scientific works were used and analyzed. The accuracy of the data interpretation finds grounds

in the acknowledgement given to the authors of the used articles. Finally, there is no conflict of interest involved in this final project.

6.2 Validity

In this final project, both research and non-research articles have met the necessary scientific criteria. All the data was searched and collected via reliable databases - CINAHL and Ovid Medline. All the collected material is published in highly credible academic journals, which affirms that the articles are written upon related scientific research.

6.3 Discussion of the results

In this section are presented the main conclusions derived from the previously gathered research. Furthermore, based on the conclusions, the study question of this final project is discussed and the subsequent knowledge test is presented.

6.3.1 Main conclusions

Based on the main conclusions of the gathered research articles, answering the study question defined several areas of knowledge, which nurses need for the nutritional assessment. Initially, nurses working in orthopaedic wards need to be aware of their nursing responsibilities, including the provision of nutritional care representing a major nursing task. To fulfil this responsibility existing international and local nutritional guidelines aid nurses in their duties. Hence, nurses need to be familiar with relevant nutritional guidelines, in which are found all the essential matters on patient nutrition and hospital policies such as the use of local hospital nutritional assessment tools. Further, nurses need to be aware of which assessment tool to apply and how to use it, when nutritionally assessing patients on admission and during hospitalization. Nursing staff needs to be aware of the specific items, from which the applied assessment tool is composed.

As part of the major nursing tasks, nurses need to pay attention at nutritional screening/assessment of patients on admission and/or in accordance with the local hospital guidelines. Nurses need to consider timely assessment of newly admitted patients that aims early detecting of patients at nutritional risk. The evidence from the research material emphasizes the high prevalence of malnourished orthopaedic patients, especially in the elderly age group of sixty-five years and older. Thus, nurses need to know that initial

nutritional assessment is fundamental for identifying malnourished patients/patients at nutritional risk. As essential part of nurses' knowledge in nutrition comprises of assessing patients for malnutrition and undernutrition, nurses need to know the characteristics of nutritional risk and the signs of malnutrition/undernutrition. In addition, nurses should be able to recognize the major risk factors for decreased nutrient intake, and consider possible postoperative complications associated with malnutrition or risk of malnutrition. Regarding orthopaedic patients nurses need to be aware that preoperative malnutrition or risk of malnutrition is related to postoperative delayed wound healing, infection of surgical site, and decubital ulcers. All these might lead to prolonged hospital stay in patients and hence, increased cost of treatment and decreased quality of life.

Furthermore, a major nursing nutritional task is also obtaining all relevant patient data. As mentioned above, great part of it is done initially. Nurses need to know how to assess nutritionally patients on admission or within the first twenty-four hours after admission. Nurses need to be familiar with the components of nutritional assessment. Together with using nutritional assessment tool, the assessment contains obtaining patients' anthropometric data such as weight, height, body mass index (BMI), triceps skin fold (TSF) and/or mid-arm muscle circumference (MAMC). Some of these components are also included as items in number of assessment/screening tools. With respect to orthopaedic patients, relevant biochemical markers such as serum zinc levels used for indicating malnutrition or risk of malnutrition also need to be addressed.

Nurses need to be aware of patients' energy and protein daily requirements, which might be calculated and discussed together with the hospital/ward dietitian. Further, nurses need to know that observations are important part of nursing nutritional care and thus, nursing responsibility of patients' nutrition. Observations regarding nutrition include patients' weight gain/loss, loss of appetite, eating and/or swallowing difficulties, and concurrent diseases affecting patients' appetite or ability to eat/swallow altogether with medical conditions causing reduced food intake and metabolic changes in patients. Monitoring and documenting patients' food and fluid intake, i.e. energy and protein intake, and checking for signs of malnutrition are fundamental nurses' knowledge on patients' nutrition and nutritional care.

Finally, nurses need to be aware of adequate nutritional nursing interventions that should be applied in each patient's case. Therefore, nurses need to know that the provision of nutritional care is bound to the preparation of nutritional care plan that covers patients'

individual needs and requirements defined via the nutritional assessment. Some of the general nutritional interventions involve encouraging patients to eat and drink, assisting patients to obtain comfortable position in bed, helping patients during meals, managing pain before meals, ensuring pleasant atmosphere during mealtimes (refreshing the air, serving the food aesthetically), providing information on food choices, providing snacks between meals, administering supplemental drinks, and paying attention at patients' preferences and special diet. Documentation of patient's nutritional status, nutrient intake, and general condition (mobility, mental state, metabolic changes) is also considered crucial for the provision of good quality nutritional care. Moreover, the involvement of patients to participate actively in the nutritional care additionally plays important role for improving patient outcome. The provision of good quality nutritional care helps avoid malnutrition and other nutritional risks among orthopaedic patients. Both preoperative and postoperative nutrition should be adjusted individually in accordance with patients' nutritional needs and requirements.

6.3.2 Design of the knowledge test

The purpose of this final project was to produce a knowledge test for nurses working in orthopaedic wards. The knowledge test aims to check nurses' knowledge on nutritional assessment. For the design of the knowledge test, it was important to suggest specific questions regarding orthopaedic patients' nutrition and nutritional assessment. On the other hand, basic knowledge on nutrition, that is crucial for the provision of good quality nutritional care, regards surgical patients broadly. Therefore, both general and specific questions are involved in this knowledge test.

In regard to this small-scale final project, the knowledge test consists of ten questions on nutritional assessment, which are derived from the priory collected research articles. The questions are presented in the form of statements, which contents are accorded to the answer of the study question of this final project. To each question there are given three options as answer: 'true', 'false', and 'I do not know'. The knowledge test is found in Appendix 2. The knowledge test has not been tested in the field. Henceforth, it gives the possibility to extend with extra questions and/or be modified in accordance with future research questions.

6.4 Recommendations

Here are some main issues that are recommended for further investigation on nurses' knowledge in nutritional assessment:

- Benefits and boundaries of nurses' need of ongoing education in nutrition in regard to improving nurses' knowledge and skills in nutrition;
- Reasons for the low priority given to nutritional assessment and nutritional care;
- Reasons for the low compliance to the nutritional guidelines and barriers in front of nutritional guidelines implementation;
- Barriers in front of the use of nutritional screening/assessment tools;
- Reasons for the difficulties met with preparing nutritional care plan;
- Nurses' attitudes and views on nutritional assessment and care;
- Nurses' knowledge and need of knowledge in nutritional matters.

The collected research material did not suggest discussions on the preparation of nutritional care plan. In similar manner, more detailed implementation of nursing nutritional interventions was not in the scope of the cited studies. These issues might become subject of future research. The role of multiprofessional team involving dietitian and the mutual work on patients' individualized nutritional care plan might be also recommended for future investigation. Regular testing of nurses' knowledge in nutrition and provision of continual nutritional education for nursing staff are crucial for ensuring the good quality nutritional care.

In this final project the focus was on the nutritional assessment of orthopaedic patients and the related nurses' knowledge. The purpose of this final project was to produce a knowledge test for nurses working in orthopaedic wards. Future development and implementation of knowledge test for checking nurses' knowledge in nutrition are suggested in order to improve the nutritional assessment and the subsequent nutritional care for orthopaedic patients. The implementation of appropriate knowledge tests might be useful in investigating nursing staff's need of further education in nutrition. Hence, testing nurses' knowledge and providing the necessary nutritional training aim to develop the nutritional care and the overall nutrition in orthopaedic patients.

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Table 3. Analyzed research articles (n=14)

Author(s), year, country where the study was conducted	**Purpose**	**Participants (sample size)**	**Data collection and analysis**	**Main results**
Bjerrum et al., 2011, Denmark	To investigate how a training programme influenced nurses' knowledge of nutrition, their awareness and attitude to nutritional management.	Registered nurses (n=16)	Focus group interviews Deductive content analysis.	*1. After the training programme, nurses more aware on their specific role, facilitation of nutritional care.* 2. *Achieved knowledge - nurses more confident, more aware of their responsibility to identify patients at risk. Nutrition - vital part of care, higher priority.* *Both before and after the training programme, nurses gave low priority to nutrition, mainly due to lack of time.* 3. *Nurses more aware of advising colleagues on the importance of nutrition, still difficult to accomplish due to workload.* *Increased awareness of importance of snack to meet patients' energy needs.* *Attempts to involve the patients in the process by informing the patients about the energy requirements.* *4. Nurses more comfortable with the screening registration forms. Patients are assessed within 24 hat an interview containing questions about nutrition, weight, weight loss and food intake. Nutritional risk assessment.* *5. Improved nurses' knowledge* *Nurses expected to learn more about nutrition, information conveying, and advising colleagues.* *Overall, nurses learnt more about nutrition, also search for evidence-based literature. Working on their own projects made them more aware of their responsibility for nutrition.*
Bååth et al., 2010, Sweden	To describe and compare RNs' and ENs' assessments for risk of malnutrition and perceptions of using relevant assessment tools.	Registered nurses (n=34) Enrolled nurses (n=43)	Statistical analysis	*1. Risk for malnutrition: RN assessed that 84% of the patients are at possible risk for malnutrition. EN assessed 90% of the same. No statistically significant differences between RN and EN regarding the MNA-SF screening score and the BMI score.* *2. More EN than RN assessed that the patient had moderate loss of appetite and weight loss. More RN than EN assessed that the patients had no loss of appetite and no weight loss.* *3. No statistically significant differences in RNs' and ENs' perceptions of using Mini Nutritional Assessment – Short Form (MNA-SF) and Modified Norton Scale (MNS) assessment tools for patients with hip fracture.*

Table 3. Analyzed research articles (n=14)

Bååth et al., 2012, Sweden	To describe RNs' and ENs' perceptions on the assessment of patients' nutrition.	Registered nurses (n=50) Enrolled nurses (n=61)	Interviews Content analysis	*1. RNs start the assessment at patients' admission to hospital, while ENs did the assessments during care provision at patients' bedside.* *2. For assessing the risk of malnutrition, Mini Nutrition Assessment (MNA) tool was used, although not on regular basis.* *3. Assessment included also observation on patients' fluid and food intake, and discussion on eating and swallowing difficulties.* *Observations of physical signs were also considered important.* *4. Documenting, planning care, and receiving relevant information from patients' significant others were also essential.*
Corish et al., 2004, Ireland	To compare NRI and NRS nutritional risk screening tools in detecting undernutrition. To determine difference in the effectiveness of both tools.	Patients (n=359)	Observational study Statistical analysis	*1. 13,6% of all patients were determined undernourished, i.e. had BMI below 20 and TSF or MAMC below 15th percentile.* *2. No difference was found between the proportion of undernourished patients younger than 65 years and those at 65 years or older.* *15% younger patients were found undernourished, and 12% of older patients were undernourished.* *3. NRI detected 57% patients to be at no nutritional risk, 38% - mild risk, and 5% to be at severe nutritional risk.* *4. NRS determined 54% of patients to be at low nutritional risk, 17% at moderate, and 29% at high nutritional risk.* *5. There were significant differences between the results obtained via the two screening tools.* *6. NRS misclassified 18% of the undernourished patients as at low nutritional risk.* *7. NRI misclassified 33% undernourished patients as at no risk.* *8. Serum albumin was in normal range in 71% of undernourished patients.* *9. In elderly patients both screening tools identified undernutrition accurately in the majority of cases, NRI 89% and NRS 100%. NRI had poor sensitivity in patients below age of 65 years, only 55% identified, while NRS identified correctly 71% of undernourished patients younger than 65 years.*
Khalaf et al., 2009, Sweden	To explore nurses' and nursing assistants' experience of and ethical reflections on nutritional care for undernourished patients.	Registered nurses (n=8) Nursing assistants (n=5)	Interviews Content-analysis	*1. To be frustrated in nursing* *Stress due to poor organization. Nutrition not being in focus during both pre- and post-operative care. Poor patient follow-up. Lack of or poor co-operation between nurses and between nurses and other professionals. Lack of competent dietician.* *2. To experience joy in nursing* *Decreased stress at work. Possibility to build up trustful relationships with patients. Ensuring pleasant atmosphere during meal times. Consideration of patients' cultural differences and special food.*

Table 3. Analyzed research articles (n=14)

				3. Undernourishment is taboo. *Undernutrition occurred before patient admission to the ward. Related to feelings of guilt, self-accusation, and denial. Ethical dilemmas.*
Mowe et al., 2008, Denmark, Sweden, Norway	To study doctors' and nurses' self-reported knowledge in nutritional practice.	Medical doctors and nurses (n= 4512)	Questionnaire.	The most common cause for insufficient nutritional practice was lack of nutritional knowledge. *1. 25% found it difficult to identify patients in need of nutritional therapy* *2. 39% lacked techniques for identifying malnourished patients* *3. 53% found it difficult to calculate patients' energy requirements* *4. 66% lacked nutritional guidelines for clinical nutrition.*
Nematy et al., 2006, England	To evaluate the nutritional state and the nutritional support provided to NOF patients.	Patients (n=25)	Observational study Statistical analysis	*1. Patients had lower BMI comparing to the mean BMI of the elderly population in UK.* *2. Patients took only 58,6% of energy requirements in hospital.* *3. Using hospital's nutritional risk assessment tool, 56% of the patients were found at risk of malnutrition on admission, increased to 68% after 2-3 weeks.* *4. 64% of the patients at risk were referred to dietitian and were given nutritional supplements. Nutritional status worsened during hospital stay.*
Oloffson et al., 2007, Sweden	To investigate whether a nutritional intervention in older orthopaedic patients had an effect on postoperative complications-	Patients (n=157)	Randomized controlled trial.	*1. Malnutrition was common among older people with hip fracture. Low MNA scores were associated with postoperative complications such as delirium and decubitus ulcers.* *2. Nutritional interventions might have contributed positively during hospitalization, but did not improve the long-term nutritional status, at least not in women.*
Ozkalkanli et al., 2009, Turkey	To compare NRS 2002 and SGA assessment tools with respect to nutrition status and development of complications in orthopaedic patients.	Patients (n=223)	Clinical research Questionnaire Statistical analysis.	*1.SGA 33% of patients were malnourished on admission, NRS 2002 showed 23% of malnourished patients.* *2.6% patients were severely malnourished SGA, and 1% were at high risk of malnutrition - NRS 2002.* *3.Nine in-hospital deaths. SGA revealed all 9 patients were malnourished, while NRS 2002 affirmed 8 out of 9 to be malnourished.* *4.In terms of postoperative complications SGA confirmed 9% of non-malnourished patients developed such, and 35% of malnourished developed such. NRS 2002 respectively declared 12% and 38%.*
Pedersen, 2005, Denmark	To test the effectiveness of nursing care based on active involvement of	Patients (n=253)	Interventional study, quasi-experimental design.	*1. Daily intake of energy increased with 23% and of protein with 45%.* *2. The intake increased from the very first day after the surgery.* *3. The intake of energy and protein was not correlated with patients' age, body mass index or type of surgery.*

Table 3. Analyzed research articles (n=14)

	patients in their nutritional care.			
Pedersen et al., 2012, Denmark	To check whether a training programme focused on the staff behavior would be effective in reducing the risk of undernutrition among patients.	Registered nurses Patients	Generic questionnaire Surveys Statistical analysis	*1. After implementing the nutritional guidelines, more patients discussed their eating difficulties with the staff, received relevant assistance during the meal, and were served the type of food they had ordered and could chew.* *2. The patients' knowledge of appropriate food choices from the menu increased, suggesting that the nutritional intake of the patients had improved.*
Persenius et al., 2008, Sweden	To study CNs' and RNs' perceptions of nutritional status assessment and nutritional assessment/screening tools. To study RNs' perceptions of documentation of nutrition and advantages and disadvantages of a documentation mode.	Chief nurses (n=42) Registered nurses (n=131)	Telephone interviews	*1. Only certain patients were assessed on admission and/or during stay. Nutritional assessment/screening tools and nutritional guidelines were seldom used.* *2. Energy intake and BMI were rarely documented. The majority of nurses documented their own judgment on patients' nutritional status.* *3. RN considered the Swedish nursing documentation model as a guideline obstructing the information exchange.*
Raja et al., 2008, Australia	To explore nurses' views and practices regarding use of MST and MUST screening tools.	Registered nurses (n=54)		*1. The initial screening using MUST showed 25% and 61% of patients screened in 2 wards.* *Only 4% screened patients using MST in two wards.* *2. Application of screening was limited by giving priority to other nursing duties, a nurse's skill to use the tool, and interpretation of patient's weight status. Some nurses applied individual judgments rather than a tool to assess the risk of malnutrition.* *3. After nurse education, the compliance improved to 46% and 70%. Barriers in using either one of the tools were identified.* *Conclusion: implementation of evidence-based tools does not automatically translate to nursing practice. Main barriers to efficient screening were nurses' time and knowledge.*

Table 3. Analyzed research articles (n=14)

Zorilla et al., 2006, Spain	To assess serum zinc levels as a tool for predicting delayed wound healing in orthopaedic patients.	Patients (n=80)	Prospective study Statistical analysis	*1. 18,8% patients were diagnozed with delayed wound healing, among whom 3,7% had superficial wound infection.* *2. The mean hospital stay of patients with delayed wound healing was 2 days longer in comparison to the patients with no delay in wound healing.* *3. Statistically significant correlation between delayed wound healing and low preoperative serum zinc level and total lymphocyte count.* *4. Preoperative deficiency of serum zinc level as indicator for delayed wound healing was confirmed; thus, an arthroplasty could be timed to minimize postoperative risk of delayed wound healing.*

Table 3. Analyzed research articles (n=14)

TEST YOUR KNOWLEDGE!
NUTRITIONAL ASSESSMENT OF ORTHOPAEDIC PATIENTS

This Nutritional Assessment Test for Nurses aims to test Your knowledge on important nutritional matters regarding patient nutritional assessment. The purpose of this test is to help nurses working on orthopaedic wards improve their knowledge in nutrition and nutritional assessment.
You will find ten statements below, each of which has three options as an answer. Check Your answer for each of the statements by choosing one of the three choices: "true", "false", or "I do not know". Only one option as an answer is possible.

1. Patients should be assessed for risk of malnutrition on admission or within 24 hours after admission to hospital.

- ☐ true
- ☐ false
- ☐ I do not know

2. Mini Nutritional Assessment (MNA) tool is appropriate tool for assessing risk of malnutrition.

- ☐ true
- ☐ false
- ☐ I do not know

3. Triceps skin fold (TSF) and mid-arm muscle circumference (MAMC) are measured in assessment for undernutrition.

- ☐ true
- ☐ false
- ☐ I do not know

4. Identifying patients' eating/swallowing difficulties is essential part of patients' nutritional assessment.

- ☐ true
- ☐ false
- ☐ I do not know

5. Nutritional screening on admission is not crucial for detecting malnourished or at risk of malnutrition patients.

- ☐ true
- ☐ false
- ☐ I do not know

6. Concurrent diseases such as dementia/depression are not risk factors for insufficient nutrient intake among elderly orthopaedic patients.

- ☐ true
- ☐ false
- ☐ I do not know

7. Preoperative malnutrition/risk of malnutrition in orthopaedic patients is associated with increased risk of postoperative complications such as delayed wound healing and infection.

- ☐ true
- ☐ false
- ☐ I do not know

8. Encouraging patients to eat and drink, ensuring comfortable position in bed, assisting patients during mealtimes, and managing pain before meals are considered part of nursing nutritional interventions.

- ☐ true
- ☐ false
- ☐ I do not know

9. Monitoring and documenting patients' nutrient intake (energy intake, protein intake) is not a major nursing task and should not be prioritized.

- ☐ true
- ☐ false
- ☐ I do not know

10. Patients' mental status and metabolic changes are not included in nutritional assessment.

- ☐ true
- ☐ false
- ☐ I do not know

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